

April 21, 1959

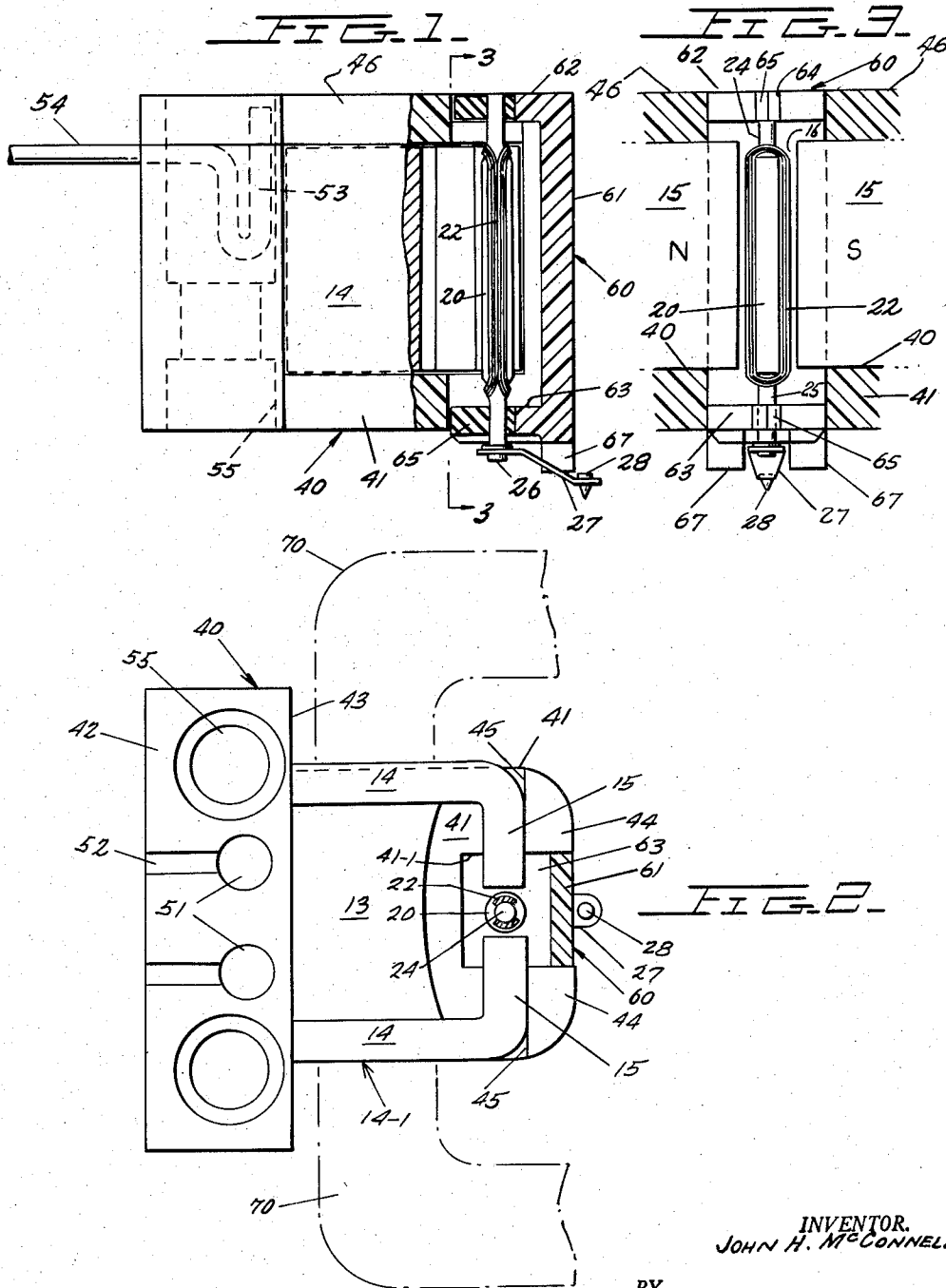
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2,883,478

MOVING ARMATURE PHONOGRAPH PICKUPS

Filed March 18, 1955

2 Sheets-Sheet 1



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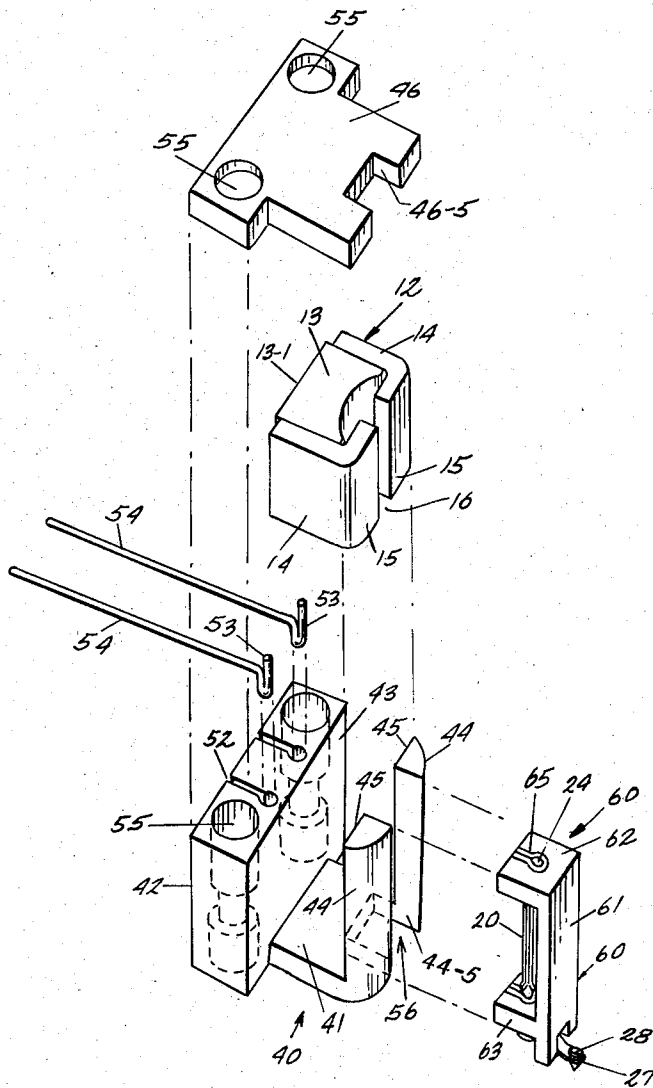
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2 Sheets-Sheet 2

FIG. 4



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MOVING ARMATURE PHONOGRAPH PICKUPS

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Application March 18, 1955, Serial No. 495,123

3 Claims. (Cl. 179—100.41)

This invention relates to phonograph pickups and more particularly to electromagnetic phonograph pickups having an armature which is actuated by a stylus to oscillate in the magnetic field of a magnetic circuit for inducing corresponding electric signals in windings interlinked therewith.

Prior are pickups of this type had to use relatively complicated and cumbersome core structures for producing the desired strong magnetic field in the narrow gap between closely spaced pole pieces in which the oscillating elongated armature was held.

Among the objects of the invention is a phonograph pickup of the foregoing type which utilizes a unitary self-supporting simple magnetic core structure having a narrow pole gap in which the oscillating armature is mounted and which avoids the need for complicated cores and core aligning and mounting structures heretofore required for such pickups.

The foregoing and other objects of the invention will be best understood from the foregoing description of exemplifications of the invention, reference being had to the accompanying drawings wherein:

Fig. 1 is a side elevational view of one form of a phonograph pickup exemplifying the invention, with parts thereof shown in cross-section;

Fig. 2 is a top view of the pickup of Fig. 1, with the top wall removed;

Fig. 3 is a view of the armature part of Figs. 1 and 2, in relation to the associated core and core mounting structure, along line 3—3 of Fig. 1 and

Fig. 4 is an exploded view of the pickup of Figs. 1—3.

Referring to the drawings which show one form of a phonograph pickup exemplifying the invention, it comprises a substantially closed-circuit magnetic system having a main magnetic core structure or core unit 12 including an intermediate core element 13 with two pole pieces 14 having pole tips 15 separated by a narrow elongated gap 16 within which an elongated magnetic armature 20 is mounted for oscillation about its elongated axis. The magnetic core structure 12 forms a self-supporting core unit, and its intermediate core element 13 is formed of permanently magnetizable material, such as Alnico material, which is permanently magnetized to produce a unidirectional magnetic flux across the pole gap 16 separating the pole piece tips 15 and through the elongated magnetic armature 20 held in the pole gap 16, the pole tips 15 being marked arbitrarily N, S to indicate that they are of opposite polarity.

The pole gap 16 between the pole tips 15 of the core unit 12 and the magnetic armature 20 extending lengthwise through the air gap 16 is quite narrow. The narrow armature 20 constitutes a pin-like structure and is formed of highly permeable magnetic material, such as Permalloy, so that the magnetic flux between the pole tips 15 traverses the armature 20. The armature 20 carries and has secured thereto elongated narrow coil winding turns 22 which oscillate with the armature, and they are so arranged that oscillation of the armature with its wind-

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ings 22 across the magnetic flux between the pole tips 15 will generate corresponding electric signals in the armature windings 22.

The pin shaped armature 20 has narrower opposite pivot ends 24, 25 with which the armature is pivotally mounted for oscillation about its elongated axis. The lower pivot end 25 of the armature has mounted thereon or affixed thereto the collar 26 of a short flexible stylus arm 27 carrying at its front end a stylus 28 shaped to engage and be oscillated by the record groove of a recording medium, such as any conventional record disc, cylinder, belt or the like. The phonograph pickup shown is intended for operation with laterally cut record grooves. Accordingly the stylus arm 27 is relatively rigid or stiff in lateral direction for transmitting the lateral stylus movement to the armature 20 while permitting yielding movement of the stylus 28 in up and down or vertical direction, or generally parallel to the axis of the armature, without disturbance to or affecting the armature 20.

In the pickup of the invention, the magnetic core unit 12 is readily assembled and held in its proper operative position relative to the armature 20 by a very simple mounting structure generally designated 40 of non-magnetic material. The non-magnetic mounting body or structure 40 adjoining the intermediate permanent magnet element 13 holds exposed therein the side arms of the two pole pieces 14 so that an external magnetizing circuit indicated in Fig. 2 by dash lines 70 may be placed in contact with them for permanently magnetizing the core element after assembling it in non-magnetized condition together with the other elements of the complete pickup in the non-magnetic mounting body 40. The core mounting structure 40 may be formed of non-magnetic metal or it may be molded from non-magnetic plastic or synthetic resin material which may be an electrical insulator.

The mounting structure 40 has a base wall 41 underlying and engaging the flat bottom aligning surface of the intermediate core element 13 and an upright rear wall 42 the flat front face 43 of which serves as an aligning surface for aligning thereon and making mounting engagement with the facing flat aligning surface 13—1 of the permanent magnet element 13 of the core unit 12. The base wall 41 has at its front edge region two upright mounting posts 44 engaging with their rearwardly facing flat aligning surfaces 45 the flat faces of the pole tips 15 for holding them and fixing the operative position of the integral core unit 12 within the mounting structure or body 40. The magnetic core unit 12 is retained in its just described operative position on the mounting body 40 by an overlying cover plate 46 of a material similar to that of the mounting body 40. The cover plate 46 is suitably affixed or joined to the underlying surface portions of the upright mounting wall 42 and the upright mounting posts 44 of the mounting body 40, as by a film of cementitious liquid applied to their facing junction surfaces.

The magnetic core unit 12 is so dimensioned relatively to the mounting body 40 that when it is positioned on the base wall 41 between the upright mounting wall 42 and the upright mounting posts 45 (Figs. 2, 4) the outer side surface of one of its two pole pieces 14, such as the outer surface 14—1 of right pole piece 14 as seen in Fig. 2, will be aligned with the underlying edge surface of the base wall 41 while the corresponding outer side surface of the other pole piece 14 will slightly project, as by about 0.005 to 0.015 of an inch beyond the underlying edge surface of the mounting base wall 41. This makes it possible to bring the two opposite poles 70 of the external magnetizing core with contact pressure against the outer side surfaces of the two core poles 14 for impressing therethrough a unidirectional magnetizing

flux on the intermediate permanently magnetizable core element 14—after having first completed, assembled and fixed the position of all elements of the pickup, as it is seen in Fig. 1, for instance.

Referring to Figs. 1, 2, 4, the upper face of upright rear wall 42 has two relatively deep positioning recesses 51 adjoined by shallow recesses 52 for holding mounted therein the folded end portions 53 of two external terminal members 54 to which the two ends of the armature coil windings 22 are connected by flexible leads, not shown. These terminal members 54 are locked and affixed in their mounted position by the overlying cover plate 46 which is secured, as by a film of cement, to the underlying junction faces of the rear wall 42 and mounting posts 44 of the mounting body 40. The upright mounting wall 42 with the overlying cover plate 46 secured thereto have aligned mounting openings 55 for receiving upwardly directed screws by means of which the pickup is secured to the downwardly facing mounting surface of a conventional phonograph tone arm or the like.

The winding carrying armature 20 is combined with a separate mounting member or armature cradle 60 of non-magnetic material, such as used for the mounting body 40 of the core unit 12. The armature cradle 60 has the shape of a generally U-shaped bridge structure with an elongated bridge member 61 having at its two opposite ends relatively short transverse bearing arms 62, 63 providing bearing supports for the opposite pivot ends 24, 25 of the elongated pin like armature 20. Each of the opposite bearing arms 62, 63 is provided with an extremely simple bearing member 65 holding therein the opposite armature pivots 24, 25 which exert thereon the minimum amount of rotation restraint. In the form shown the rearward edge portions of the upper and lower cradle arms 62, 63 are each provided with a relatively narrow bearing slit 64 in which are positioned two bearing members 65 of rubber-like elastomer material, each provided with a small perforation or opening within which the respective pivot ends 24, 25 of the armature are pivotally held. The bearing members 65 of elastomer material are made of somewhat greater width than the bearing slits 64 of armature-cradle bearing arms 62, 63, so that the bearing members are slightly compressed when, after being first positioned on the armature pivots 24, 25, they are pushed or moved into their proper position within the two bearing slits 64 of the opposite bearing arms 62, 63 of the armature cradle 60. Alternatively, the bearing members 65 may be formed of two relatively narrow strips of elastomer material folded over the armature pivot ends 24, 25, and forcibly pushed with the armature pivot ends 24, 25 into their proper operating positions within the bearing slits 64 of the bearing arms 62, 63 of the armature cradle or mounting structure 60, wherein the bearings are retained by the elastic restoring forces of the slightly compressed elastomer bodies of the bearing members 65.

The core mounting body 40 with its integrally joined cover plate 46 are provided at their front region with aligning positioning surfaces which form a mounting body recess 56 shaped for receiving and joining thereto interfittng complementary aligning surfaces of the armature mounting structure or cradle 60 and holding it in the proper operative position in which the elongated armature 20 is held for oscillation in the air gap 16 between the pole tips 15 of core unit 12. In the form shown, the core mounting body 40 with its cover plate 46 is provided with an aligning recess generally designated 56 formed by recess-forming aligning surfaces 44-5 and 46-5 of its base plate 41 and its cover plate 46, respectively, which are shaped for fitting engagement with complementary aligning surfaces of armature cradle 60 when it is positioned within the mounting body recess 56. After bringing the armature cradle 60 into its aligned position within the aligning recess 56 of core mounting

body 40, they are affixed to each other along their interfittng mating aligning surfaces by application of a film of suitable cement or the like. The lower end of the armature cradle 60 is provided with downwardly projecting stylus guards 67 which also serve to limit the lateral excursions of the stylus arm 27.

The magnetic core unit 12 may be readily made so as to exactly fit in its operative interfittng position within facing aligning surfaces of the mounting body 40 in engagement with the upper face of the base wall 41 and between the rear wall and front mounting post 45 of mounting body 40. The intermediate permanent magnet core 13 is provided with a flat, ground, smooth rear, bottom and top wall surface facing corresponding flat aligning surfaces of the base wall 41, the mounting posts 44 and the cover plate 46 of the mounting body 40. The intermediate permanent magnet element 13 is also provided with two flat, ground, smooth surfaces against which the facing surfaces of the L-shaped pole pieces are placed in assembling and joining them into an integral core unit 12. The pole pieces 14 are formed of permeable magnetic metal and they have flat aligning side surfaces facing the flat, ground, opposite end surfaces of the intermediate core element 13. After the intermediate core element 13 and the two adjoining flat arms of the pole pieces 14, which have the same height, have been brought into their assembled position, such as shown in Figs. 2 and 4, they are held clamped therein, as between two clamping jaws of an electrical heating circuit for heating them to the temperature of molten solder. Thereupon, solder is applied to the exposed junction edges of the junction surfaces between the side arms of the pole pieces 14 and the end faces of the core element, and the assembly is heated so that the molten solder will flow by capillary action along these junction faces and unite them into an integral magnetic core unit 12.

After assembling the core unit 12 in its operative position on the core mounting structure 40 between the positioning flat surfaces of the upright mounting wall 42, the mounting posts 44 and cementitious liquid is applied to their junction surfaces for thereby joining them into an integral structure in a position where one of the outer surfaces, such as outer surface 14-5 of one of the pole pieces 14, is in substantial alignment with the underlying side edge of the bottom mounting wall 41, while the opposite pole piece side arm projects slightly, as by .005 to .020 of an inch, beyond the underlying side edge of the bottom mounting wall 41. After completing this assembly, the terminal wires 54 are placed with their looped inner end portions 53 into the terminal recesses 51 of the upright mounting wall 42. The armature cradle 60 is then moved into its inward operative position within the recess 56 of the mounting body 40 and the ends of the armature coil windings 22 are joined, as by soldering, to the inner ends 53 of the terminal members 54. Cementitious liquid is applied to the facing junction surfaces of the so assembled components, and the assembly is completed by placing the cover plate 46 over the upper faces of the upright mounting wall 42 and the upright mounting post 45 the cover member plate 46 for securing them to each other.

The features and principles underlying the invention described above in connection with specific exemplifications will suggest to those skilled in the art many other modifications thereof. It is accordingly desired that the appended claims shall not be limited to any specific features or details shown and described in connection with the exemplifications thereof.

I claim:

1. In a phonograph pickup for translating undulations of a record groove into electric signals, an elongated axially extending armature of magnetic core material and a stylus for oscillating said armature around its axis; a complementary core unit of magnetic core ma-

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terial having two end regions held spaced and separated from an intermediate region of said core unit, and constituting two pole arms overlapping said intermediary core region and having two opposite pole faces aligned along opposite sides of said armature generally parallel to said armature axis and forming with said armature a substantially closed magnetic circuit; windings interlinked with said magnetic circuit; at least one core element of said magnetic circuit being permanently magnetized for inducing a unidirectional magnetic flux interlinking said armature, said core unit and said windings; said core unit constituting with its said two pole arms an integral self-supporting entity; a non-magnetic mounting structure engaging said core unit and connected to said armature for holding said armature in operative position relative to said core unit; the space separating the end regions of said two pole arms facing overlapped portions of said core unit being free from any portions of said mounting structure which hold said armature in operative position relatively to said pole arms.

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2. In a phonograph pickup as claimed in claim 1, at least a part of said complementary core unit being permanently magnetized, and two spaced portions of said core unit being exposed to exterior space, whereby said core unit may be permanently magnetized by exterior magnetizing means after assembly of said core unit and said armature into an operative unit.

3. In a phonograph pickup as claimed in claim 2, said core unit including an intermediate permanently magnetized core element and two core arms extending from opposite surfaces of said core element and forming said two pole arms.

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